

DECENTRALIZED AND TACTICAL AIR TRAFFIC FLOW MANAGEMENT

FINAL REPORT

Amedeo R. Odoni (Principal Investigator)

Dimitris Bertsimas

Massachusetts Institute of Technology

1.1.11
24-04-02
OCT
103159

BRIEF PROJECT DESCRIPTION

This project dealt with the following topics:

1. Review and description of the existing air traffic flow management system (ATFM) and identification of aspects with potential for improvement.
2. Identification and review of existing models and simulations dealing with all system segments (enroute, terminal area, ground)
3. Formulation of concepts for overall decentralization of the ATFM system, ranging from moderate decentralization to full decentralization
4. Specification of the modifications to the ATFM system required to accommodate each of the alternative concepts.
5. Identification of issues that need to be addressed with regard to: determination of the way the ATFM system would be operating; types of flow management strategies that would be used; and estimation of the effectiveness of ATFM with regard to reducing delay and re-routing costs.
6. Concept evaluation through identification of criteria and methodologies for accommodating the interests of stakeholders and of approaches to optimization of operational procedures for all segments of the ATFM system.

These topics are addressed by the project's deliverables. The work performed at MIT, in close co-ordination with the C.S. Draper Laboratory has contributed materially to the advancement of understanding of related issues and to the development of new algorithmic approaches for ATFM as it applies to airport, terminal airspace and en route airspace congestion. It should be noted that: the Ph.D. dissertation of Sarah Stock (Deliverable 3 below) has been awarded the first prize of the 1997 Dissertation Competition of the Transportation Science Section of INFORMS and the Second Prize in the INFORMS Nicholson Competition for Best Student Paper (in any field); and the paper on characteristics of alternative future concepts for decentralized ATFM by Adams, Kolitz, Milner and Odoni (Deliverable 1) was one of four papers published in a Special Issue on ATFM of *Air Traffic Control Quarterly* and has been presented and discussed extensively at several professional conferences.

DELIVERABLES

All deliverables for the project have been completed and copies are attached as follows:

1. Report on the characteristics of alternative concepts for decentralized ATFM and the advantages and disadvantages of each. See Attachment 1
2. Critical survey and description of optimization models for tactical and strategic aspects of ATFM and their potential role in a partially decentralized ATFM environment. See Attachment 2.
3. PhD dissertation by Sarah Stock on optimizing air traffic flows on a network through a combination of ground-holding, en route speed control and re-routing. See Attachment 3.
4. SM thesis by Mina Sheel on the optimal tradeoffs between airborne and ground delay in the presence of uncertainty about airport capacity. See Attachment 4.